

## MARKET ANALYSIS OF CARAWAY SEED

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### Executive Summary

This paper investigates the current state of the international and Australian caraway market and explores the market opportunities for Australian caraway producers. It provides a baseline assessment of the global industry, using the limited information currently available, and identifies areas for further research. The report is based on the data and literature available through secondary sources including the databases of the Food and Agriculture Organization (FAO), World Trade Organization (WTO), United Nations International Trade Statistics Database (UN ComTrade) and the World Bank.

The market data available for caraway is limited and is often presented in a larger group of spices including juniper, anise, badian and fennel as a whole seed (not ground or crushed). It is not possible to separate the individual spices from this grouped data so in these instances the overarching trends have been assessed.

Caraway (*Carum carvi* L.) is a small herb belonging to the Apiaceae family and is a biennial crop (Malhotra, 2012). Caraway fruit, which is known as caraway seed, are oblong with five pale ridges, brown in colour and about 3-6 mm long (Malhotra, 2012). The dried fruits of caraway are commonly used as a spice in baking and cooking, are believed to hold medicinal properties, and the essential oil of caraway is used in different types of liqueurs for flavouring (Shelef, 2003).

Caraway is cultivated in many parts of the world, with Finland and Canada the largest exporting countries with the leading market destinations being India, Germany and the US. Significant price variations exist in international markets, depending on the crop's origin, with the average price of Canadian spices over US\$1,750/tonne, whereas the price of Indian caraway was only US\$1,266/tonne (ITC, 2019, UN Com Trade, 2019). Price variation could also be due to cost of production in the source country.

Australia's domestic market for caraway and other similar spices is entirely supplied through imports. In 2018, Australia imported about 568 tonne of the caraway spice group (juniper, anise, badian, caraway, fennel), worth about US\$1.37million. About 70% of imported spices in Australia were sourced from India and China (UN Com Trade, 2019).

In 2018 Australia's import price for the group of spices was US\$2,408/tonne. Given the unit value and the size of the





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market, it is likely that it would be favourable for local industry in Australia to initially target the domestic market before scaling up for international markets.

The authors acknowledge the financial support of the Cooperative Research Centre for Developing Northern Australia (CRCNA) and the support of its investment partners: The Western Australian, Northern Territory and Queensland Governments. We also acknowledge the financial and in-kind support of the project partners.

## Introduction

Caraway (*Carum carvi* L.) is a small herb belonging to the Apiaceae family and is a biennial crop (Malhotra, 2012). Caraway is also known as meridian fennel or Persian cumin (Rasooli and Allsmeh, 2016). The caraway plant has a slender branched stem and grows to about 50-60cm tall. The plant has a fleshy root and the flower colour is white (Spice board, 2019). Caraway fruit, which is known as caraway seed, are oblong with five pale ridges, brown in colour and about 3-6mm long (Malhotra, 2012). The dried fruits of caraway are commonly used as a spice in baking and cooking. It is also used as a seasoning in sausages and for medicinal purposes (Spice board, 2019). The essential oil of caraway is used in different types of liqueurs for flavouring (Shelef, 2003).

Historical records indicated that caraway has been used in Middle Eastern Asia for about 5000 years (Malhotra, 2012). It is believed that the word caraway originated from the province Caria in Asia Minor (currently known as the Asian part of Turkey) (Shelef, 2003). It is also native to Northern Africa, Mediterranean and western Asia. Caraway is a good source of fibre, vitamins and minerals (Table 1). The seeds have a slightly sharp taste and sweet flavour (Malhotra, 2012).

Table 1. Chemical composition of caraway seeds

Content	g/100 g	Vitamins	mg/100 g	Content	mg/100 g
Moisture	9.9	Vitamin B <sub>1</sub>	0.38	Calcium	689
Protein	19.8	Vitamin B <sub>2</sub>	0.38	Potassium	1351
Fat	14.6	Vitamin C	21	Phosphorus	568
Carbohydrate	49.9	Vitamin A	363 IU	Sodium	17
Energy value	1393 kJ	Niacin	3.6	Magnesium	258
Fibre	38				

Sources: Malhotra, 2012; Rudrappa, 2019

## Scope and limitations of the study

This report presents a preliminary market analysis of caraway seeds, which includes current production and international trade. The report is based on the data and literature available through secondary sources including the databases of the FAO, WTO, UN ComTrade and the World Bank. The report also includes an overview of Australian caraway market and scopes the potential for a future caraway industry in Australia.

This study has limitations due to lack of caraway-specific data, as the caraway seed market data are often grouped with other spices, namely anise, badian, fennel and juniper. Among the leading caraway-producing countries, country-specific production data is only available separately for Finland. Hence this report presents combined data and the end-users of this report need to take care of using this information and understand its limitations.

This study also includes some indicative trading prices of the group of spices from available data and which might not properly reflect accurately the trading prices of caraway seed. This report does not provide a detailed value-chain analysis, but does comment on some value-added products of caraway.

Analysis of the production practices, methods, and agronomic factors affecting yield and seed quality will be provided in subsequent reports of this CRCNA Project (A.2.1819045) based on the field varietal trials being undertaken as part of this project.

## Global caraway production and value

Caraway is cultivated in countries including Finland, Canada, Egypt, Syria, Netherland, and Afghanistan (Malhotra, 2012). Recently caraway seed production has also been reported in Germany. Caraway is traditionally a crop grown in dry temperate climates or subtropical dry summer climates. Annual caraway thrived in the cool short days of the Eastern Mediterranean winter and in the Indian plains (Arganosa et al., 1998). The literature (Javed et al. 2020) suggests that the crop prefers low temperatures of 16-20 °C for flowering and seed setting of biennial types (winter types), whereas annual types of caraway require more heat for seed production (Svab, 1992). The crop is grown in cooler season in the tropics. It grows well in well drained soils, preferring a pH of 6.0-7.0.

Limited information is available in the literature regarding production data for caraway and reports detailing the largest caraway producing countries vary between the sources. For instance, literature in “*Economic Botany*” indicated that Canada is the largest caraway producer (85% of world production) and exporter (Kochhar, 2016), while in 2018 Finland reported it produced more than 12,000 tonnes of caraway and held about 25% to 30% share of global export (Luke, 2019, Lizarazo, 2019). Finland’s production data is presented in Figure 1.

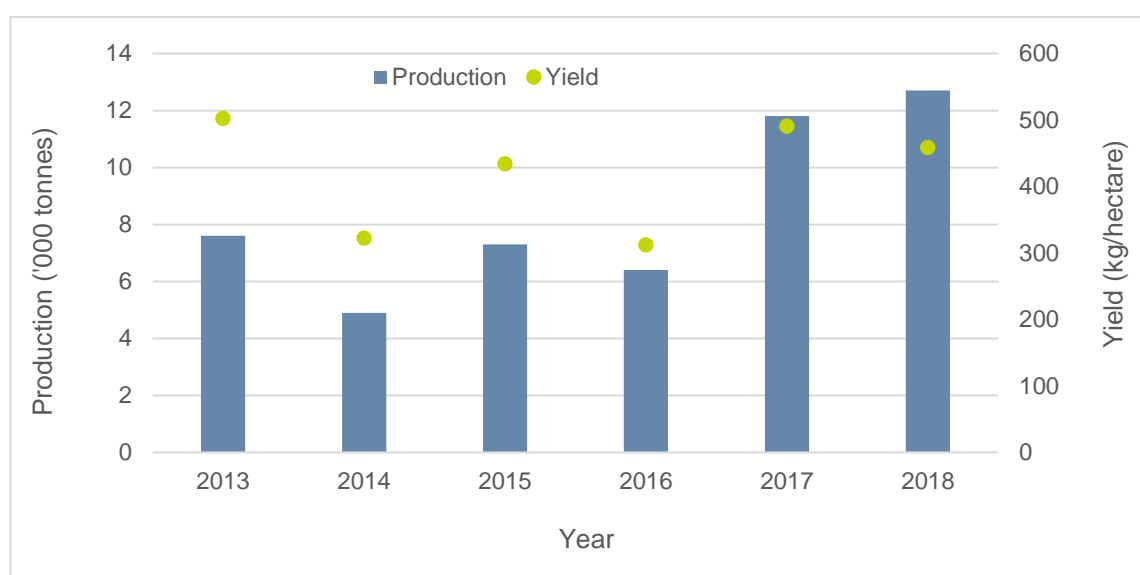


Figure 1: Annual production quantity and yield in kg/ha of caraway in Finland (Data Source: Luke, 2019)

According to the Finland government estimation, Finland was on track to produce 15,300 tonnes in 2019, however the available reports did not mention the area under caraway cultivation. In 2018, caraway was cultivated on over 27,000 hectares of land, with an average yield of caraway of 425kg/ha.

In contrast, in the Saskatchewan province of Canada, which produced most of the Canadian caraway, caraway was grown on approximately 2,023ha of land with an average yield of 800kg/ha (GOS, 2018).

## Caraway exporting countries

As noted above, UN Com Trade and International Trade Centre (ITC) databases include caraway grouped with other spices – juniper (*Juniperus communis* Linn.), anise seeds (*Pimpinella anisum*), badian (*Illicium verum*), and fennel (*Foeniculum vulgare* Mill.) – with the leading exporting countries of this group of spices by volume being India, China, Syria and Vietnam (Table 2). Between 2014 to 2017, on average, the global market of these spices increased by 19.5% annually. As a complete and longitudinal data set is not available from a single source, it is difficult to predict the driving force

behind this trend, but it may be driven by population growth and the increasing purchasing power of middle-class consumers.

Table 2. Major spice exporting countries from 2014 to 2017 (Spices crops include juniper berries, anise seeds, badian, caraway and/or fennel).

2014		2015		2016		2017	
Country	Volume (tonnes)	Country	Volume (tonnes)	Country	Volume (tonnes)	Country	Volume (tonnes)
India	12453	India	13465	India	31156	India	37492
China	6948	China	7461	Syria	8822	China	9399
Syria	6412	Syria	6250	China	7740	Vietnam	7843
Egypt	6205	Vietnam	5817	Vietnam	5514	Syria	6986
Vietnam	6131	Egypt	3828	Egypt	5076	Egypt	5223
Turkey	3718	Turkey	3090	Turkey	3452	Turkey	1887
Germany	1523	Netherlands	1921	Germany	1469	Spain	1719
Netherlands	1430	Germany	1642	Netherlands	1293	Germany	1637
Canada	1237	Serbia	1170	Spain	1260	Canada	1619
Pakistan	1208	Canada	998	UAE	1240	Netherlands	1477
<b>World total</b>	<b>55844</b>		<b>54475</b>		<b>75339</b>		<b>88510</b>
<b>Global annual average changes in volume: 19.5%</b>							

Source: ITC, 2019 & UN ComTrade, 2019

The above table indicates that India is the largest producer of these spices, but, there is no information on the production of caraway independent of the other spices in India. Despite this, Finland, Canada and Egypt are thought to be largest caraway exporters in the world.

### Finland

Finland exports caraway to more than 40 countries with its three major market destinations being India, Germany and the USA (Figure 2) (Lizarazo, 2019, Com Trade, 2019). The unit price of caraway based on the trade value available in the UN Comtrade database indicated that the highest unit prices among the top 10 export destinations were achieved in the USA (US\$ 2,094/tonne), with Australia paying US\$ 1,341/tonne for caraway from Finland, and the average unit price being US\$1,697/tonne.

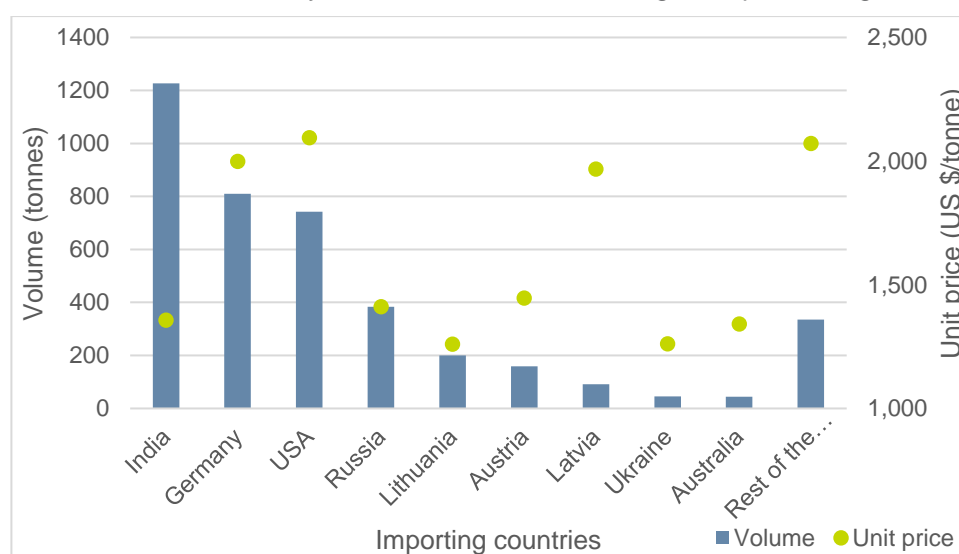


Figure 2. Top export destination of Finnish spices (juniper berries and anise seed, badian, caraway or fennel), Data source: ITC, 2019

## Egypt

In 2018, Egypt exported the selected group of spices to more than 55 countries. Vietnam is the main importer of the Egyptian spices followed by Algeria. The total value of the exported spice group (juniper, anise, badian, caraway or fennel) from Egypt in 2018 was more than US\$23 million, which is about 64% higher than 2017.

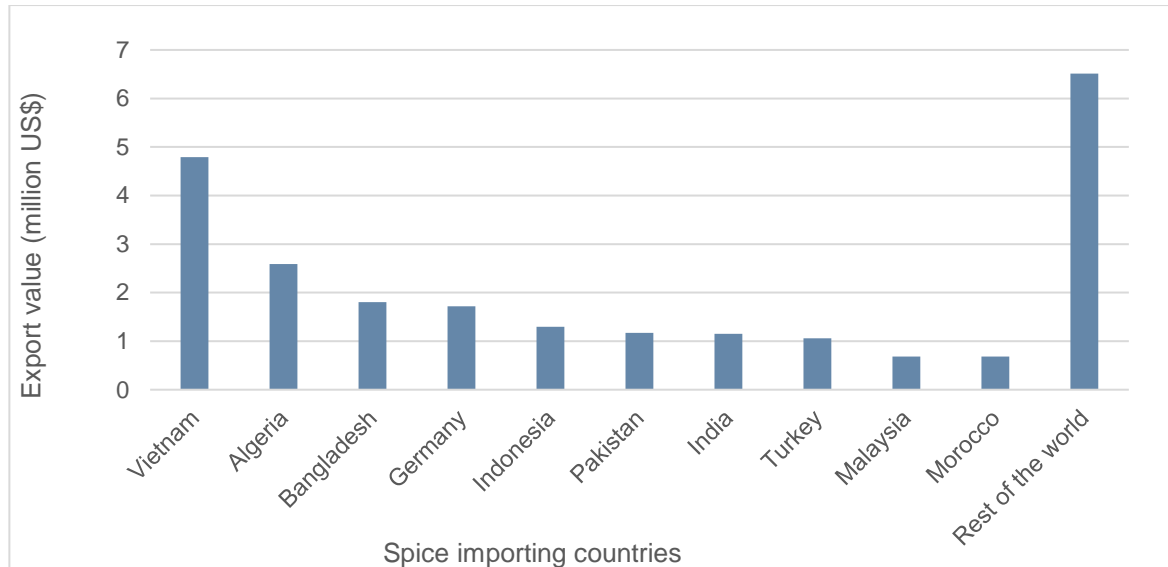


Figure 3. Top export destination of Egyptian spices (juniper, anise, badian, caraway or fennel). Data source: ITC, 2019, UN Com Trade, 2019.

The average trading price of Egyptian spices is US\$3,504/tonne, which is higher than the trading price of the same group of Finnish spices (calculated from total trading value, Source: ITC, 2019). Since the price of individual spices is not available, this price may only be indicative for caraway seeds.

## Canada

In 2011 Canada exported about 1,000 tonnes of caraway seeds with a trade value of over US\$1.9million (Com Trade, 2019). About 89% of Canadian caraway and similar spices were exported to the USA (Figure 4). Canada also exported about 79 tonnes of spices in India. The average trading price of Canadian spices was more than US\$1,750/tonne which is similar to the trading price for the USA, but well above the trading price of US\$1,266/tonne in India.



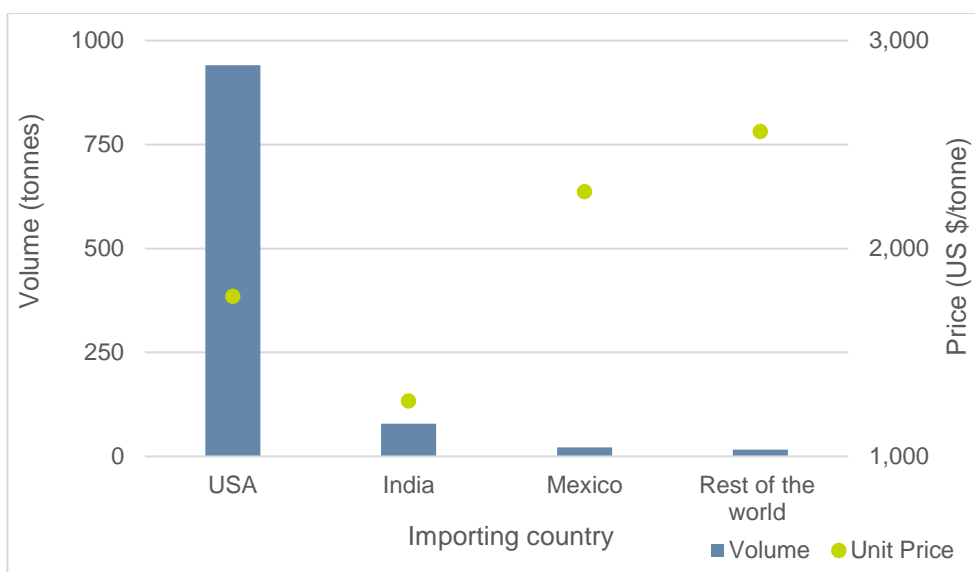


Figure 4. Top export destination of Canadian spices (juniper, anise, badian, caraway or fennel), Data source: ITC, 2019, UN Com Trade, 2019

### Caraway importing countries

The data presented in this section is for spice group noted above. India imported the highest amount of these spices, followed by Germany (Table 3). Country specific import quantity is available in UN databank but not for all countries. India imported about 14,300 tonnes of these spices in 2018, while Germany and USA imported 12,950 tonnes and 8,760 tonnes respectively in the same period.

Table 3. Major spice importing countries (juniper, anise, badian, caraway or fennel) importing countries

	2016 (source: www.trademap.org)		2018 (Source: ComTrade)	
Rank	Country	Value ('000 USD)	Country	Value ('000 USD)
1	India	34,706	India	45,045
2	Germany	29,781	Germany	33,043
3	United States of America	21,743	United States of America	21,744
4	Algeria	8,410	Turkey	6,587
5	United Kingdom	6,267	United Kingdom	6,393
	<b>World Total</b>	<b>197,312</b>	<b>World Total</b>	<b>214,953</b>

The average import price of the selected group of spices was US\$ 2,402/tonne in 2017, with large variations between countries.

### India

In 2018, India imported more than 14,000 tonnes of the spice group, which was 44% higher than the previous year (Figure 5). The major share, about 58% of imported spice, was sourced from Vietnam, while India also imported a significant amount of spices from Afghanistan, Egypt and Finland (Figure 6). The trend line of the imported volume of spice indicates that by 2025 the demand will be 22,000 tonnes. The trading price for 1tonne of imported spice was about US\$3,120 in 2018 (ITC, 2019).

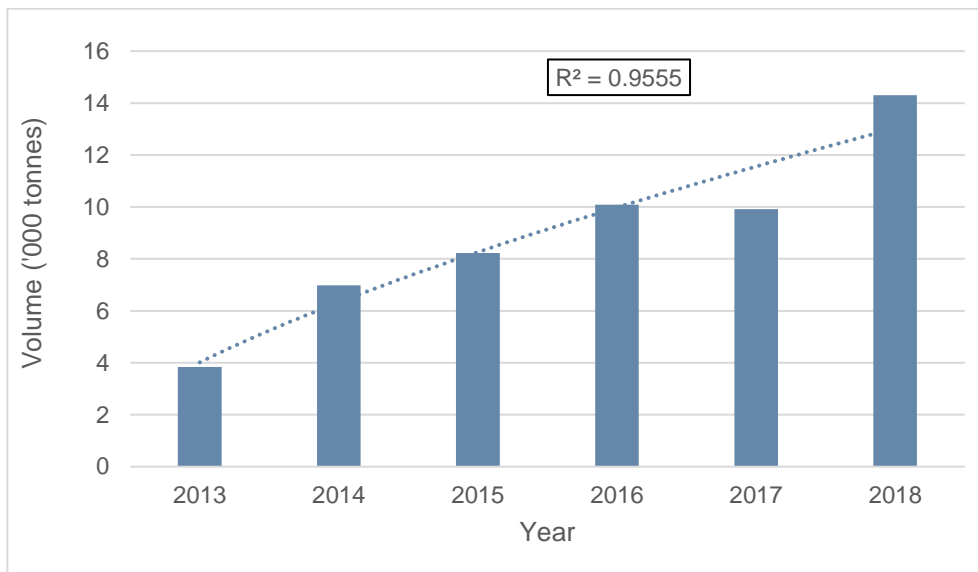


Figure 5. Quantity of spices imported by India (juniper, anise, badian, caraway or fennel). (Data source: UN ComTrade, 2019)

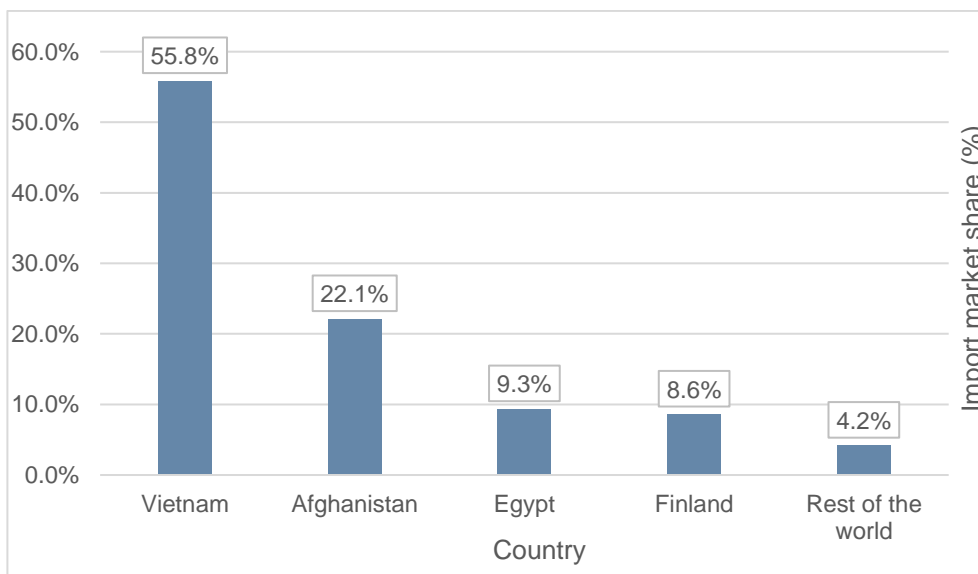


Figure 6. Origin of imported spice in India (juniper, anise, badian, caraway or fennel). (Data source: ITC, 2019).

### Germany

In 2018, Germany imported about 13,000 tonnes of spices mainly from Egypt, China and some European countries (ITC, 2019). From 2017 to 2018 trade value of imported spices increased by 11%. Over the last six years, the spice importing trend in Germany exhibits steady growth (Figure 7), which if it continues, is expected to reach 23,000 tonnes by 2025. In 2018, Germany spent about US\$ 2,550/tonne on imported spices.



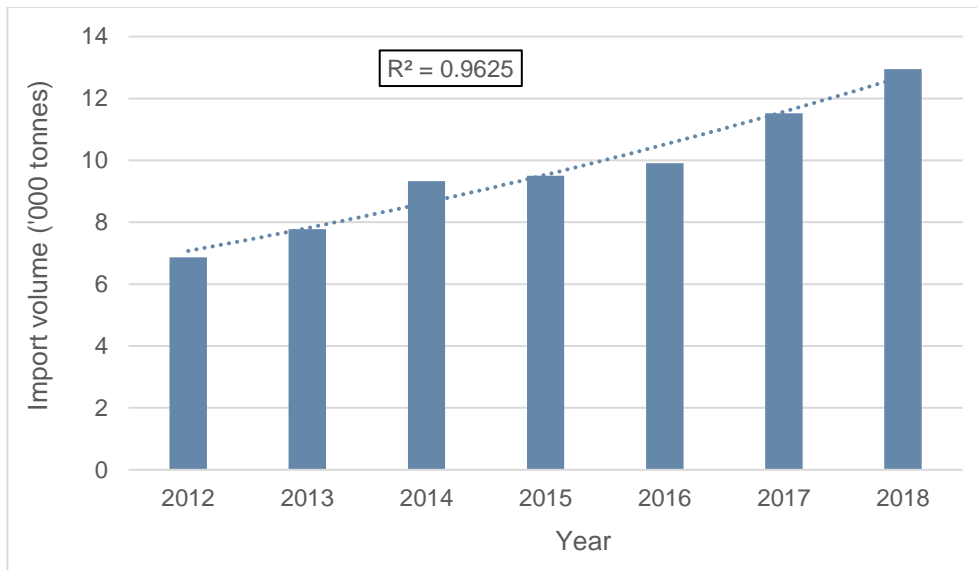


Figure 7. Quantity of imported caraway and other spices in Germany (Data source: UN ComTrade, 2019)

### USA

The USA is the third-largest importer of this group of spices, taking US\$21million worth in 2018. The import quantity over the last few years fluctuated but it is estimated to reach 10,000 tonnes in 2025 (Figure 8). Egypt and India are the main spice exporters to the USA and they hold about 60% of the market share. Canada and Finland also export spices to the USA and together they hold about 20% of the market share. In 2018, the price of caraway in the USA was US\$ 2,480/tonne (ITC, 2019).

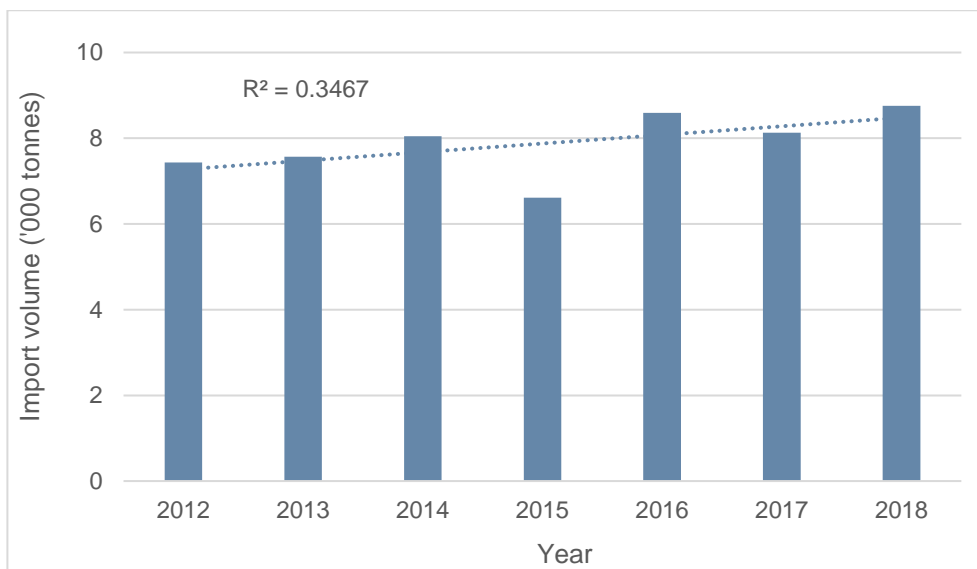


Figure 8. Caraway and other spices importing trend in USA. (Data source: UN ComTrade, 2019)

### **Australian caraway market**

Australia's domestic market for caraway and other similar spices is entirely supplied through imports. In 2018, Australia imported about 568 tonnes of the spice group, worth about US\$ 1.37million. About 70% of imported spices in Australia were sourced from India and China. Finland and Vietnam also contributed about 15% supply of the spice market in Australia (ITC, 2019).

Over the last five years the amount of imported spice increased by about 50%. The trend line (Figure 9) indicates that by 2025 the demand for caraway and similar spices in Australia will exceed 2,000 tonnes/year.

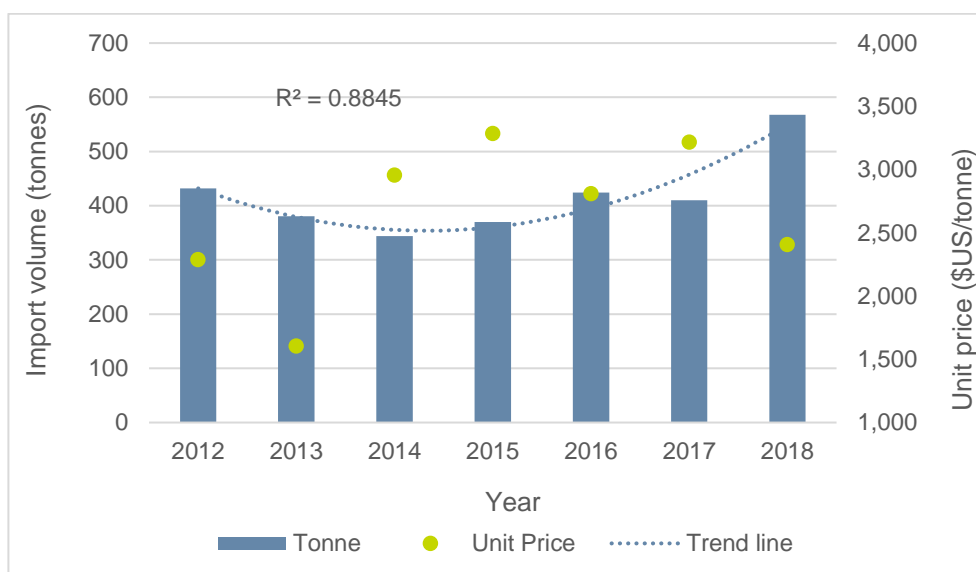


Figure 9. Trend of Caraway and other spices trade in Australia (Data source: ITC, 019, UN ComTrade, 2019)

The unit trade price of caraway and the other spices in this group was volatile over the last few years. However, in 2018, the price was US\$ 2,408/tonne. Given the unit value and the size of the market, it is likely that it would be favourable for local industry in Australia to initially target the domestic market before scaling up for international markets.

### Value-added caraway products

Caraway seeds are mainly used as flavouring for various food products. In Germany, it is used in baked bread. In other European countries such as Austria and Italy, caraway is commonly used in stew and meat dishes (Malhotra, 2012). Use of ground caraway as flavouring for alcoholic drinks is common in Denmark, Germany and Russia (Javed, et al, 2020). In the Middle East, caraway is used in a popular dessert, meghli pudding and in Syria, it is an additive in the sweet scone, Kelecha (EIC, nd.).

The entire caraway plant, including roots and leaves, are edible. The roots can be consumed like carrot or parsnips, while young leaves can be used in salad or can be cooked (Laflamme, 2016). Caraway seed meal can be used as a feed additive in fish diets (Ahmad and Abdel-Tawwab, 2011).

The essential oil of caraway can be extracted from the seed and it has the same medicinal properties as the seed. Caraway has several medicinal uses including perceived benefits for controlling obesity (Kazemipour et al., 2015). Caraway is used as medicine in the different part of the world, including a remedy for indigestion in Poland, treatment of pneumonia in Russia and treatment of inflamed eczema in Indonesia (Johri, 2011). Caraway has both antibacterial activity and antioxidant properties (Rasooli and Allameh, 2016). Literature also indicates that caraway has an anti-diabetic, anti-inflammatory effect (Mahboubi, 2019).

Caraway oil is also used in soaps, lotions and perfumes as a fragrance component (Laflamme, 2016).

The vast array of applications of caraway for value-adding warrants further and more detailed investigation of these opportunities if an Australian caraway supply chain can be established.

## Quality Standards

The quality standards of caraway whole seed as prescribed by the American Spices Trade Association (ASTA) and ISO are listed in Tables 4 and 5.

Caraway whole seeds means the dried seed of the plant. The quality standards for Indian Caraway seed as defined by Pruthi (2012) suggest that extraneous matter, including foreign edible seeds, chaff, stem straw, dust, dirt, stones and lumps of earth should not exceed 5% by weight. The amount of insect-damaged matter should not exceed 5% by weight. The cleanliness specifications for caraway seeds are defined by ASTA (Table 4).

Table 4. Cleanliness specifications for caraway seed as per ASTA

Crop	Whole insect dead (count/lb)	Excreta mammalian (mg/lb)	Excreta other (mg/lb)	Mould (% w/w)	Insect defiled infested seeds (% w/w)	Extraneous foreign matter (%)
Caraway seed	4	3.00	10.00	1.00	1.00	0.50

Source: Muggeridge et al., (2001).

The minimum specific quality indices for caraway seed defined by ISO includes maximum total ash content of 8%, maximum acid soluble ash content of 1.5%, maximum seed moisture of 13% and minimum volatile oil contents of 2.5% (Table 5).

Table 5. Quality standards for caraway seed as per ISO Commodity

Commodity	Total ash (% w/w)	Acid soluble ash (%)	Moisture content (% w/w)	Volatile oil (% w/w)
Dutch Caraway seed	8	1.5	13	2.5

Source: Muggeridge et al., (2001)

## Conclusion

The demand for caraway and similar spices, in both Australian and international markets, is predicted to increase in coming years.

Australian producers in the short term may access the existing domestic market of caraway and similar spices, which has a current value of around US\$ 1.4M. A more accurate assessment of market value for domestic crops will depend on the quality (see tables 4 and 5 referring to ASTA and ISO quality standards) of the caraway seeds. This needs to be ascertained through trial production before production is assessed on a commercial scale.

The current CRCNA 'Spicing up the North' project is designed to provide scientific information about caraway varietal performance and environmental suitability. The project will also assess the gross margins of caraway production in Australian conditions during the verification and commercialisation phases.

Further research will be required to consolidate on this establishment phase and address questions including:

- A detailed supply and value chain analysis to investigate factors including logistics (storage, segregation, transport etc), product processing infrastructure, consumer preference and the viability of value-added products.
- Business, agronomy and environmental risks and uncertainties to grow caraway at commercial scale in Australia.

*The CRCNA acknowledges the support of its government partners.*



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